



# **Computer Assisted Exercise (CAX) Command Staff Training**



# Topics

- **Intro to M&S Support for CAX**
- **Air Warfare Simulation (AWSIM)--Air Force**
- **Aggregate-Level Simulation Protocol (ALSP)/Joint Training Confederation (JTC)**
- **Distributed Interactive Simulation (DIS) Protocol**
- **High-Level Architecture (HLA)**
- **Summary**

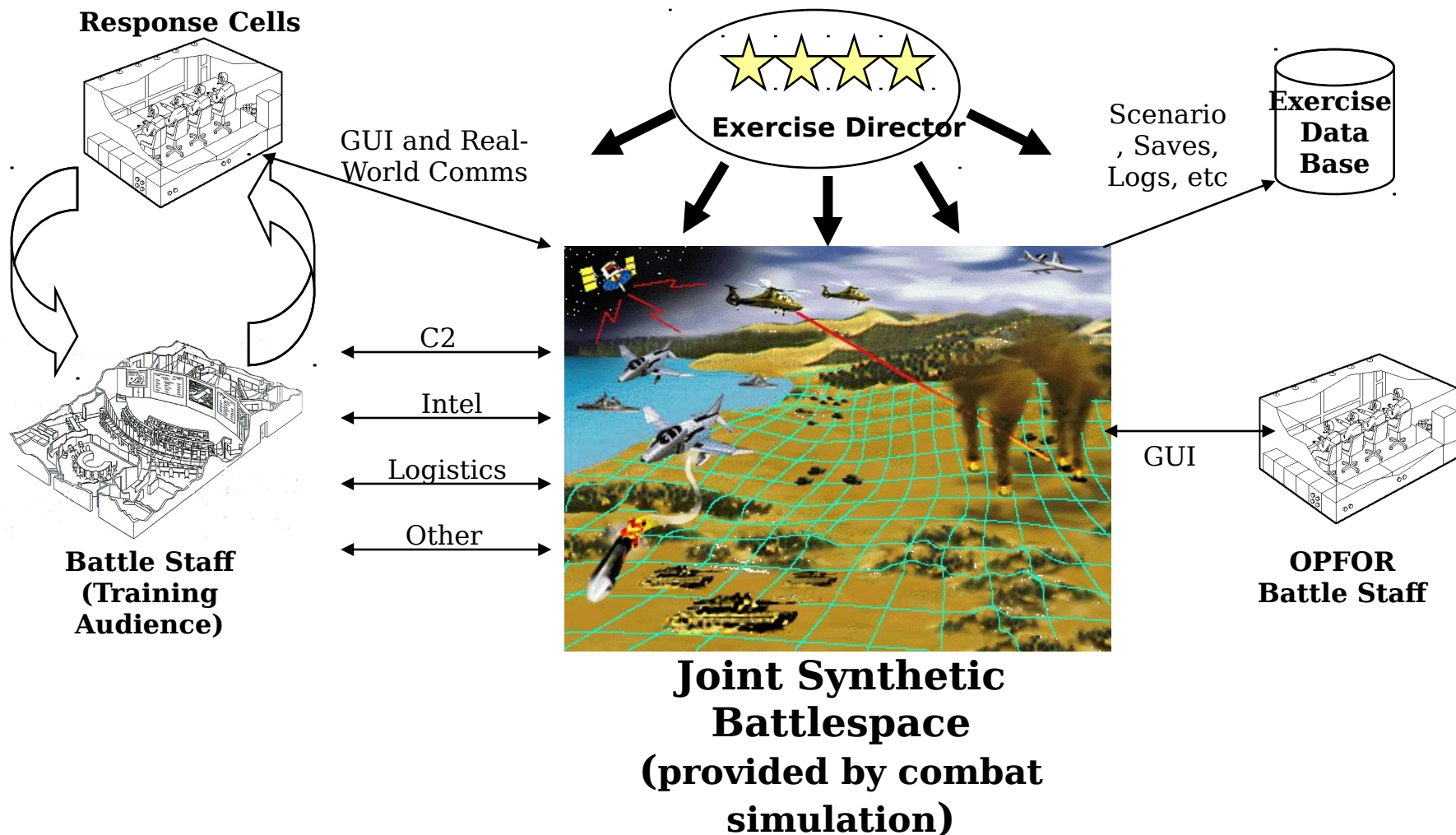


# What is CAX?

- **Computer Assisted Exercise (CAX) Training:** The use of computer based simulation to represent elements of the operations space, in a simulated real-world situation, where commanders and their staffs can train as they would conduct real-world operations, against a live enemy
  - Saves exercise and training resources
  - Allows training in ways otherwise impossible
  - Prepares commanders and their staffs for the situations that they will face in real operations
  - Simulates command experience which develops experienced commanders
  - Tests and exercises interoperability between C4I systems

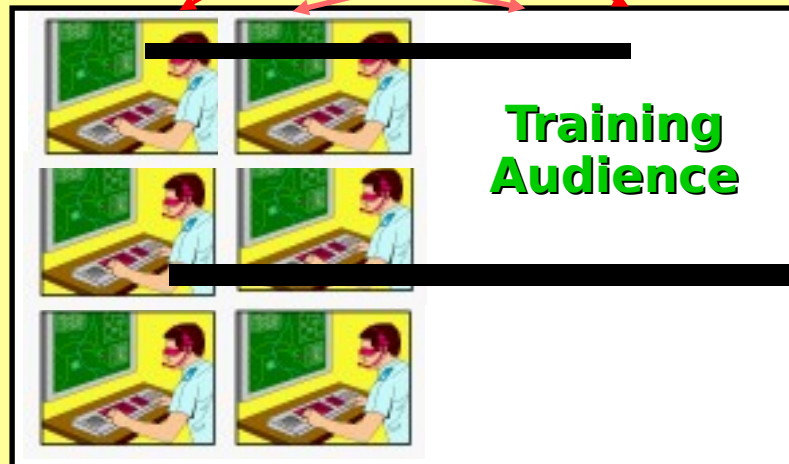
**CAX Training increases operational mission effectiveness through real-life command experiences!**

# Computer Assisted Exercise (CAX)

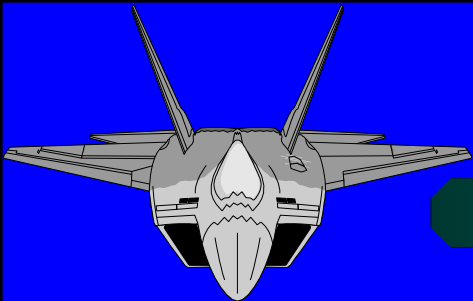




# CAX Environment



**Synthetic Battlespace Provides  
Realistic Environment in Which to Train**



***Air Warfare  
SIMulation  
AWSIM 2.0***



## **AWSIM 2 - What Is It?**

- **Real-time, interactive, two-sided, time-stepped & discreet event, entity-level simulation**
  - **Used by Air Component Commanders, their staffs, and other organizations to educate/train/develop doctrine and tactics, formulate/assess operational plans, and assess warfighting situations**
  - **Exercise training audience plays against a thinking, interactive OPFOR**
  - **Opposing sides define, structure, and control their forces**
  - **60 and 10 second game cycles**
  - **Variable rate events (ex., missile flyouts at 1 second rates)**
  - **Interfaces to other service simulations**
  - **Interfaces to virtual simulations**



## **AWSIM 2 - What Is It?**

- **Planning, tasking, and execution similar to real-world procedures at Air Operations Center (AOC)**
  - **ATO is the primary player input via CTAPS, translated by response cells using semi-automated tools into AWSIM orders**
  - **Engagements evaluated at shooter/weapon/target level**
  - **Interactions with other models for ground, naval, EW combat**
  - **Results translated into operational and intel reports by combination of response cells and automated tools, interface to real-world C4I systems**
  - **Stimulus for real-world C4ISR system testing and training**



# AWSIM



- Interfaces with other models
- Synchronize clocks
- Exchange data
- Export results



- Move aircraft, ships, SAM sites
- Navigate & expend fuel
- Defined routes & orbits, or manual control

**Motion**



**Flightline Ops**

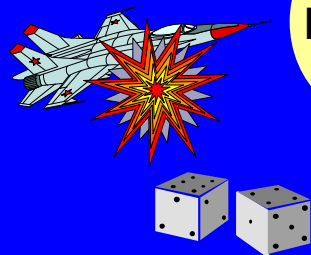
- Launch & recover aircraft
- Shelter/unshelter aircraft
- Sortie generation & management
- Load/unload munitions

**Orders**



*Nominal 1-minute game cycle (ALSP)*

**Damage**



- Evaluate damage based on shooter, weapon, & target
- Change status & report

**Engagement**



- Air-to-air
- Surface-to-air
- Air-to-surface
- Expend weapons
- Manual or automatic pairing

**Detection**



- Radar & visual detection
- By aircraft & surface sites
- Active & passive (ESM)
- Considers RCS, day/night, horizon

**ESC is the developer for USAF Combat Simulations**



# Scenario Generator

- **Object Creation**
- **Scenario Definition**
  - **Bases**
  - **Squadrons**
  - **Assets**
- **Scenario Review & Error Check**



# Object Creation

Aircraft Characteristics Screen

Aircraft Characteristics

Aircraft Name :  ▼

**Attributes**

Cruise Spd. (kts) : <input type="text" value="500"/> <input type="text" value="500"/>	Class. Range (nm) : <input type="text" value="5"/> <input type="text" value="5"/>	Air Effect. Mult. : <input type="text" value="50"/> <input type="text" value="50"/>
Max. Speed (kts.) : <input type="text" value="500"/> <input type="text" value="500"/>	Det. Range (nm) : <input type="text" value="5"/> <input type="text" value="5"/>	Gnd Effect. Mult. : <input type="text" value="50"/> <input type="text" value="50"/>
Max. SL Spd (kts) : <input type="text" value="500"/> <input type="text" value="500"/>	Cross Sect. (dB) : <input type="text" value="5"/> <input type="text" value="5"/>	Standoff Eff. Mult. : <input type="text" value="50"/> <input type="text" value="50"/>
Max. Range (nm) : <input type="text" value="500"/> <input type="text" value="500"/>	Launch Del. (min) : <input type="text" value="5"/> <input type="text" value="5"/>	A/C Category : <input type="text" value="JET"/>
Max. Climb (ft/min) : <input type="text" value="500"/> <input type="text" value="500"/>	Op. Delay (min) : <input type="text" value="5"/> <input type="text" value="5"/>	React to Attack : <input type="text" value="NO"/>
Max. Alt. (ft) : <input type="text" value="500"/> <input type="text" value="500"/>	Refuel Delay (min) : <input type="text" value="5"/> <input type="text" value="5"/>	Expend Weapons : <input type="text" value="NO"/>
Min. Alt. (ft) : <input type="text" value="500"/> <input type="text" value="500"/>	Full Mission Cap. (%) : <input type="text" value="5.0"/> <input type="text" value="5"/>	Invisible : <input type="text" value="NO"/>
JP Fuel (lbs) : <input type="text" value="500"/> <input type="text" value="500"/>	FLIR : <input type="text" value=""/>	Shelter Priority : <input type="text" value="MED"/>

**Probabilities**

System Failure (%) : <input type="text" value="1"/> <input type="text" value="1"/>	Prob. of Base Attack Damage (%) : <input type="text" value="5.0"/> <input type="text" value="5.0"/>	Std. Dev. of None Sch. Maint. (min) : <input type="text" value="100"/> <input type="text" value="100"/>
Sys Fail in 2 hrs. (%) : <input type="text" value="1"/> <input type="text" value="1"/>	Prob. of Battle Damage (%) : <input type="text" value="5.0"/> <input type="text" value="5.0"/>	Flight Time between Sch. Maint (min) : <input type="text" value="100"/> <input type="text" value="100"/>
Successful Launch (%) : <input type="text" value="1"/> <input type="text" value="1"/>	Prob. of Ground Abort (%) : <input type="text" value="5.0"/> <input type="text" value="5.0"/>	Mean Time between Failure (min) : <input type="text" value="100"/> <input type="text" value="100"/>
Successful Recover (%) : <input type="text" value="100"/> <input type="text" value="100"/>	Prob. of Routine Break (%) : <input type="text" value="5.0"/> <input type="text" value="5.0"/>	Mean Time to Repair Routine Maint (min) : <input type="text" value="10"/> <input type="text" value="10"/>
		Time to Perform Sch. Maint. (min) : <input type="text" value="200"/> <input style="border: 2px solid red; text-decoration: underline;" type="text" value="10"/>

**Equipment / Weapons**

Mean time to perform scheduled maint: 0 to 1,000 min.



# Squadron Creation

AWSIM Main

[Login](#) [Scenario](#) [Monitors](#) [Utilities](#) [Logout](#) [Windows](#) [Print](#) [Help](#)

Squadron Generation Screen

## Squadron Generation

[Print](#) [Remarks](#)

Scenario : CT98 ▼

**Squadron View / Side**

Information Only, Not Editable!

View : 4 Side : BLUE

**Squadron Information**

Squadron Name :	01FS ▼	Aircraft Type :	F5E ▼
Base Type :	airbase	Aircraft Quantity :	24
Base Name :	KIMP ▼	Mission :	NONE ▼
Country :	Korea, Republic of (South) ▼		

[Commit](#)
[Delete](#)
[Update](#)
[◀](#)
[◀](#)
[View](#)
[▶](#)
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[New](#)
[Copy](#)
[Exit](#)

Name of the mission

AWSIM SGen Main Screen



# Typical AWSIM Order Stack

**FOR JUTE SCRAMBLE 4 213RG MISSION# OCAP2 180 450 25000**  
**LOAD 2 AA10C 4 AA11**  
**MISSION AD**  
**REFUEL MISSION OPFORTKR OFFLOAD 5000**  
**PROCEED POSITION N51-35 E09-10**  
**ASSIGN CAP CPSN**  
**BLOCK 20000 25000**  
**WEAPONS FREE AIR**  
**DEASSIGN CAP TIME 60**  
**BINGO**

▽

AIR TERMINAL

Enter password:

Station 001 is ready. Press ? for orders syntax help and  
<CTRL-W> for control character help.  
Configured for the 'AWSIM and ALSP' ground subtargets.  
(250545) --  
>



# Typical ASTAB

VIEW: BLUE1

[3] BASE AND CARRIER STATUS/HISTORY - PAGE 1

GAME TIME: 010100

-----GENERAL DATA----- CURRENT A/C MX STATUS----- TOTAL A-A -SQ AC LOSSES-- -BASE/CARR INFORMATION-- DIVERTED

BASENAME	TYPE	SQUADRON	DVT	ID	TYPE	A/C	ABN	A/L	5	15	30	60+	GA	CA	SRTIE	KILLS	AAE	SAM	OTH	ONG	STATUS	LR	DTGOPEN	MXSTAT	FROMBASE
----------	------	----------	-----	----	------	-----	-----	-----	---	----	----	-----	----	----	-------	-------	-----	-----	-----	-----	--------	----	---------	--------	----------

BITBURG	BASE	22FS			BT	F15C	.	.	21	.	.	.	.	21	.	.	.	.	.	.	.	CLOSED	1	010500	DSGR75	
BUECHEL	BASE	392FS			BC	TORNADOI	.	.	18	.	.	.	.	18	2	.	.	.	.	.	.	CLOSED	1	010824	OK	
		393WW	1		BC	TORNADOE	.	.	16	.	.	1	.	18	.	.	.	.	.	.	.					
FAIRFORD	BASE	402BS			FF	B52H	1	.	2	.	.	1	.	4	1	.	.	.	.	.	OPEN			OK		
KEARSEAG	CARR	VMFA331	2		KS	AV8B	2	.	2	.	.	.	.	6	4	.	.	.	.	.	OPEN			OK		
		VMAH332			KS	AH1W	.	.	8	.	.	.	.	8	.	.	.	.	.	.						
RAMSTEIN	BASE	496FS	4		RM	F15E	.	.	18	.	.	.	4	26	4	3	1	1	.	.	OPEN			DSGR89		
		512FS			RS	F16C	4	4	11	.	1	3	.	23	8	3	.	.	1	.						
		526FS			RS	F16C	.	.	19	.	.	4	2	25	4	2	.	.	1	.						
		9FS			RN	F117	2	.	16	.	.	.	.	18	2	.	.	.	.	.						
SEMBACH	BASE	496FS	***		RM	F15E	.	.	2	1	.	1	.	.	.	.	.	.	.	.	OPEN			OK	RAMSTEIN	
SPANGDAH	BASE	81WW			SP	F4G	2	.	10	.	.	.	.	12	.	.	.	.	.	.	OPEN			OK		
		55TES			SP	EF111	1	.	2	.	.	.	1	4	1	.	.	.	.	.						
		393WW	***		BC	TORNADOE	.	.	.	.	1	.	.	.	.	.	.	.	.	.				BUECHEL		
		VMFA331	***		KS	AV8B	.	.	.	1	.	1	.	.	.	.	.	.	.	.				KEARSEAG		
GRAND TOTALS							12	4	145	2	2	11	7	183	26	8	1	1	2	.						

DISPLAY: ALL

ENTER:

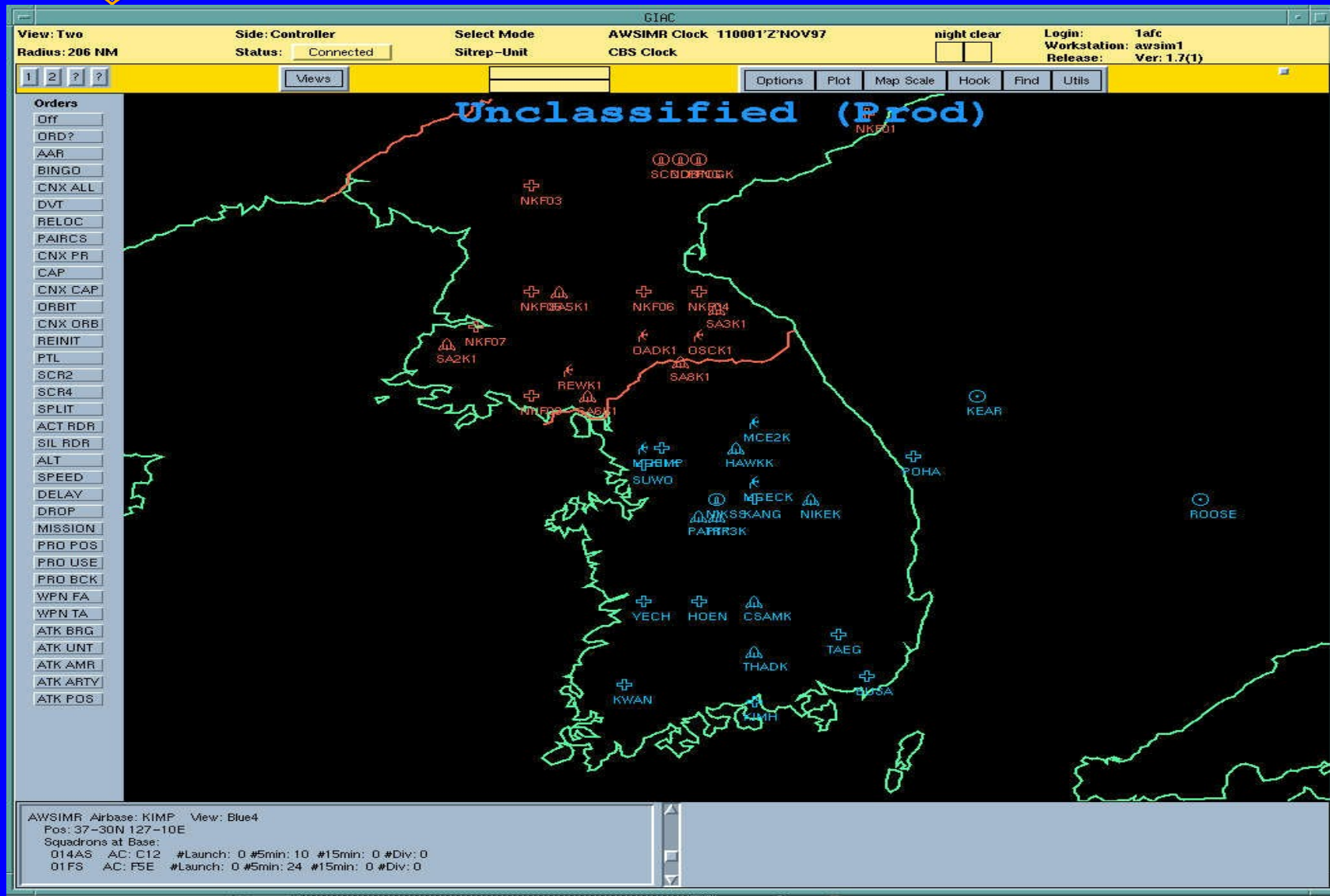


# **Graphical Input Aggregate Control GIAC**





# GIAC





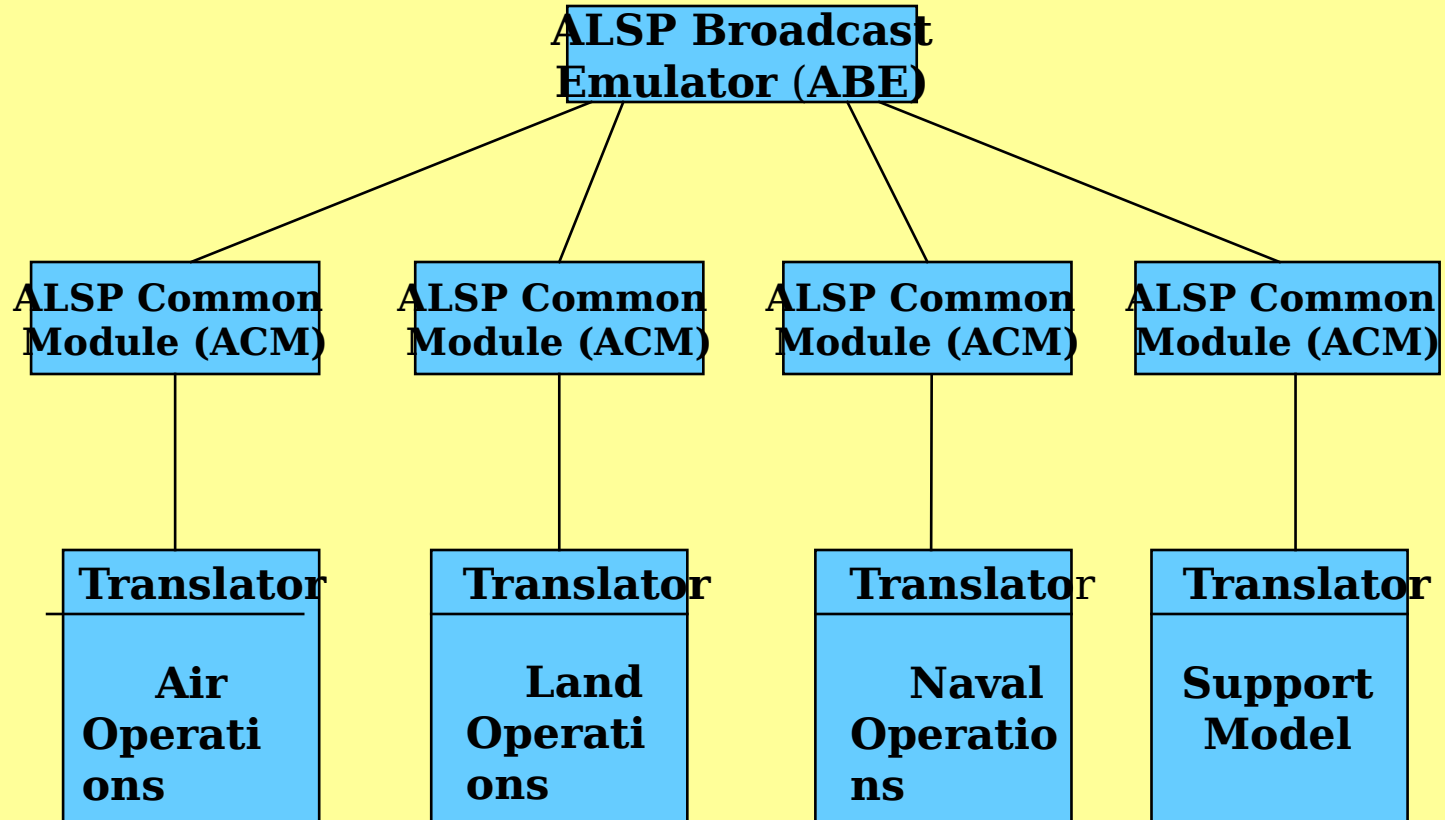


# Wargame



# Confederation of ALSP Capable Models (Joint Training Conf.)

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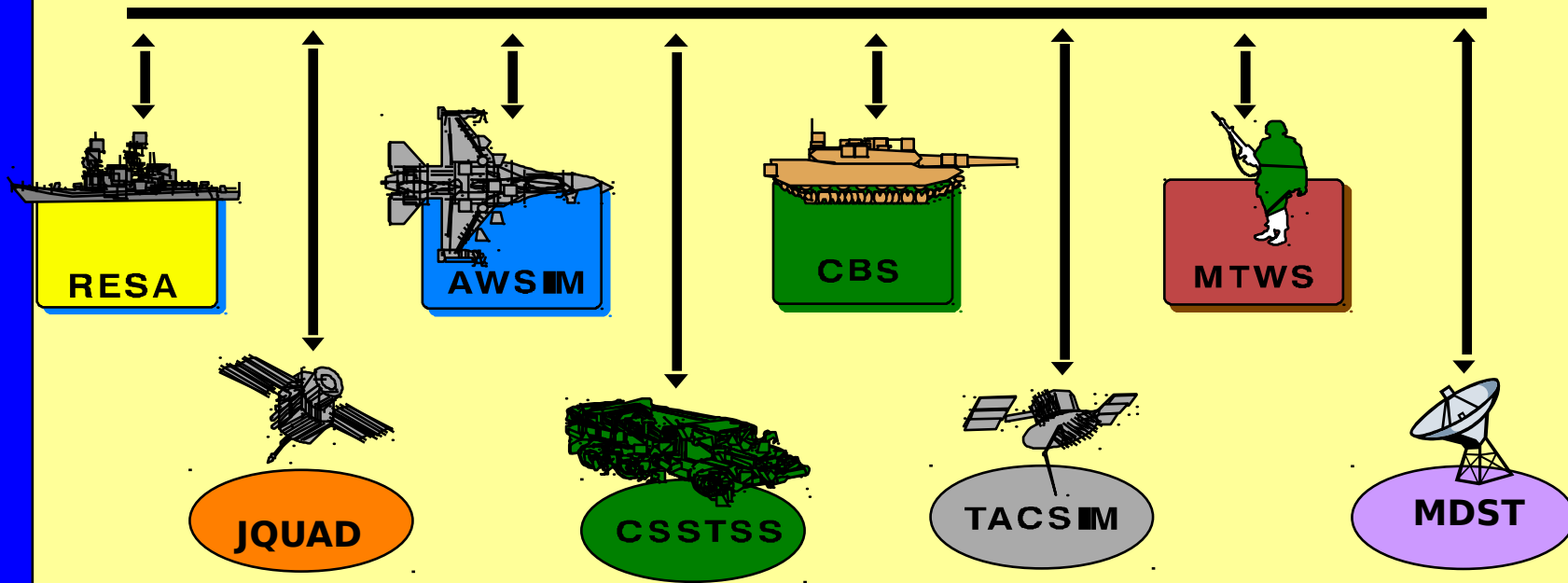
**ALSP Connects Legacy Models Via Standard Protocol**



# Joint Training Confederation

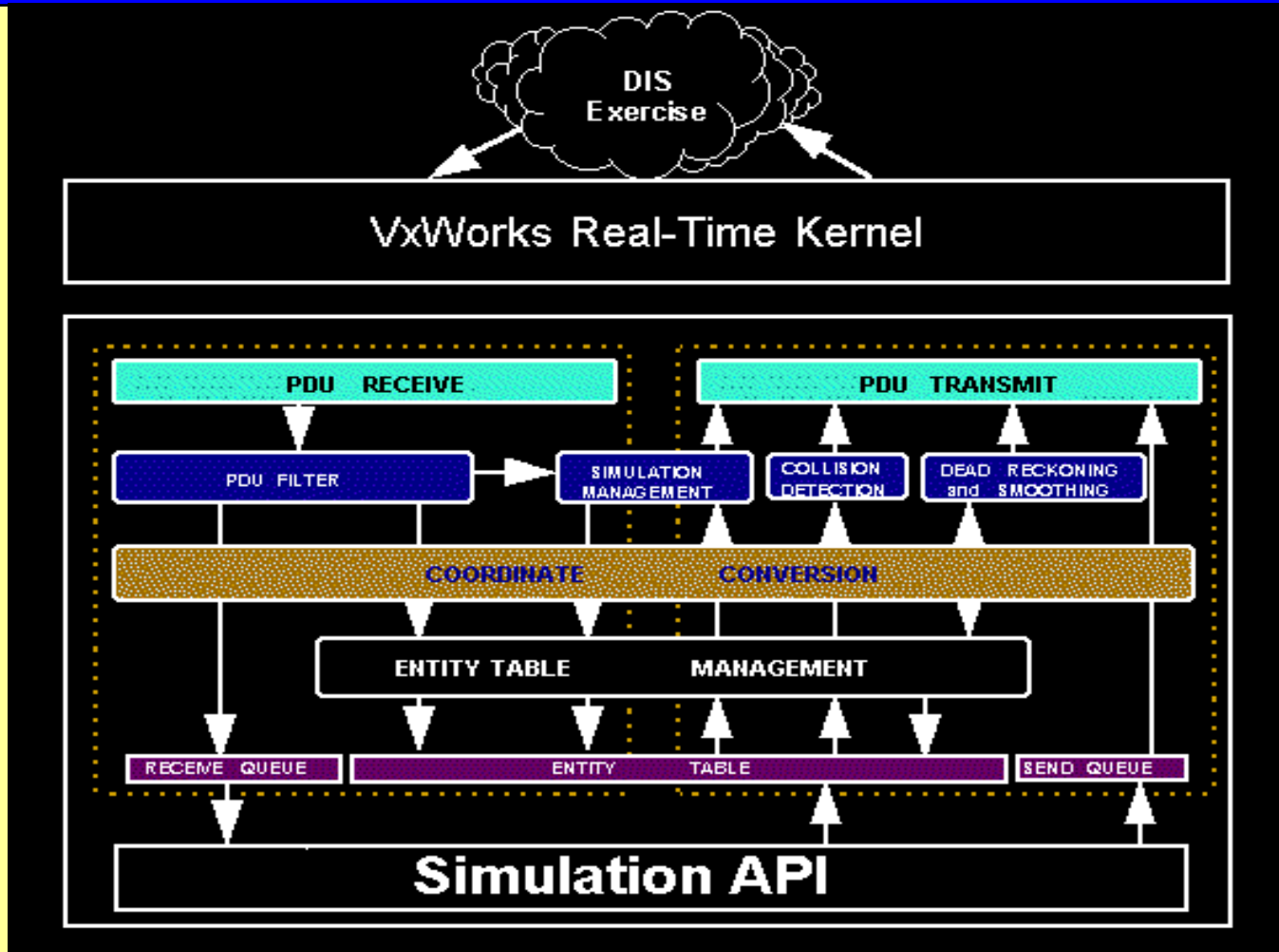
**ALSP**

**AGGREGATE LEVEL SIMULATION PROTOCOL**





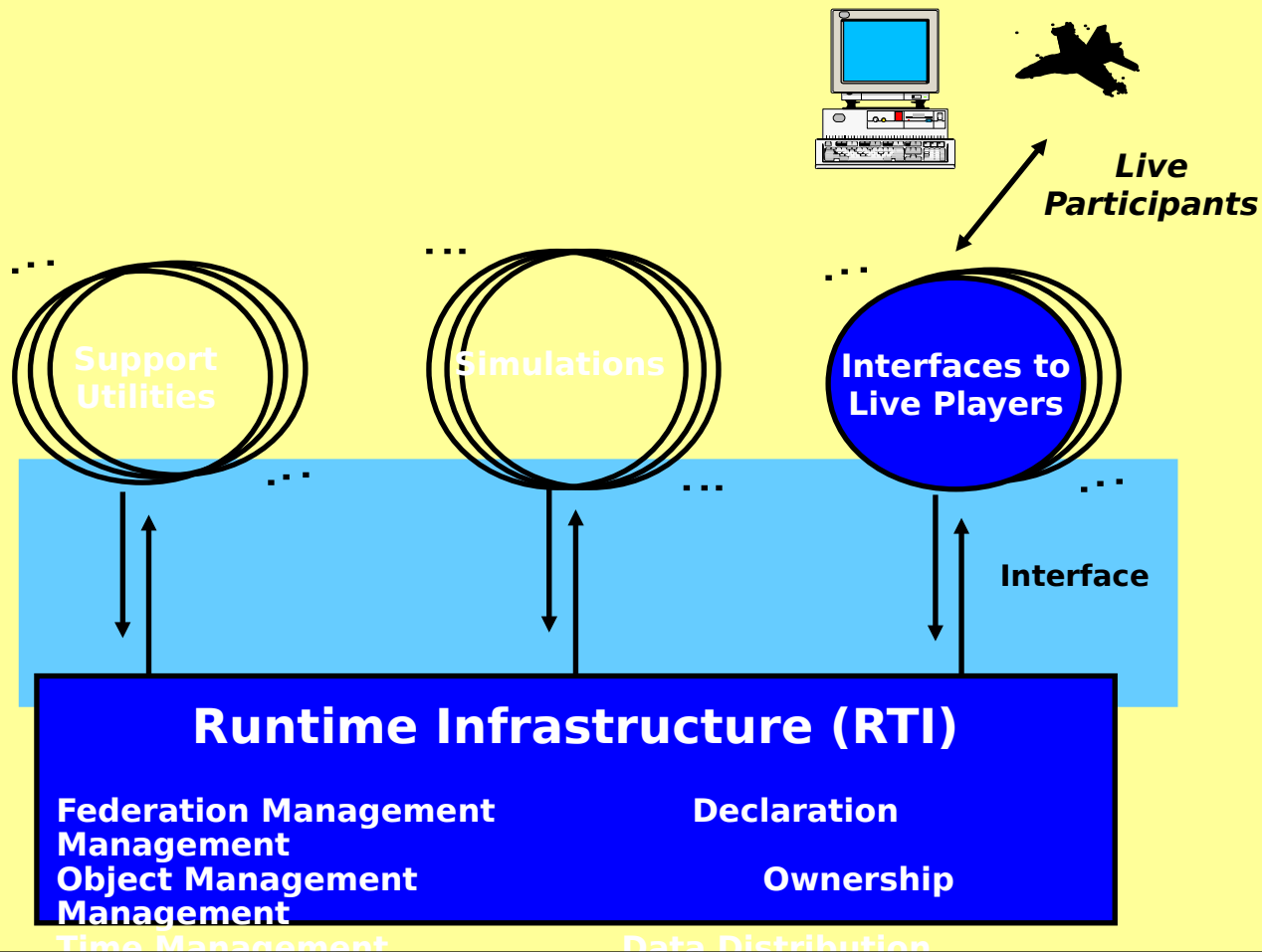
# Distributed Interactive Simulation Interface





# Migrating to the HLA, a DoD/NATO Standard

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**HLA is the COE for the simulation environment**



# Conducting an Exercise

- **Defining Objectives**
- **Planning**
- **Execution**
  - **Set up**
  - **Exercise Play**
  - **Post-Exercise Review/Analysis**

**Conducting Exercises Requires More Than  
Just Running Simulations**



# Summary

- **CAX training can provide coalition command staffs with a cost effective mechanism for training in simulated real-world operations**
- **Operation space simulations such as the JTC provide effective models for simulating the detail of lower echelons**
- **Establishing a dedicated CAX facility requires consideration of physical resources, personnel, schedule and cost but this can be lessened through rationalization**
- **Exercises require defining objectives, planning, and execution**
- **Simulated command experience can develop experienced commanders**

**Conducting Effective Coalition CAX Training Requires an Overall Planning and Investment Strategy**